

What is claimed is:

1 1. A method for sampling a high temperature process stream, comprising
2 the steps of:
3 evacuating a low temperature zone of a sampling system using a vacuum pump;
4 admitting a portion of the high temperature process stream into the low
5 temperature zone through an orifice;
6 maintaining a stable vacuum pressure in the low temperature zone; and
7 introducing a sample from the low temperature zone of the sampling system into
8 test equipment through a sample introduction valve.

1 2. The method of claim 1, wherein the orifice has a diameter of between
2 0.005 inches and 0.025 inches.

1 3. The method of claim 1, wherein the step of maintaining a stable
2 vacuum pressure in the low temperature zone includes metering flow to the vacuum
3 pump.

1 4. The method of claim 1, wherein the step of maintaining a stable
2 vacuum pressure in the low temperature zone includes controlling the vacuum pump.

1 5. The method of claim 1, wherein a temperature of the high temperature
2 process stream is above a boiling point of a target sample component at the process
3 stream pressure.

4 6. The method of claim 1, further comprising the step of maintaining a
5 temperature of the low temperature zone above a boiling point of a target sample
6 component at the stable vacuum pressure.

1 7. The method of claim 1, wherein the test equipment includes a mass
2 spectrometer.

1 8. The method of claim 1, wherein the test equipment includes a FT-ICR
2 mass spectrometer.

1 9. The method of claim 8, wherein the FT-ICR mass spectrometer
2 includes a second vacuum pump, and the method further comprises the step of evacuating
3 with the second vacuum pump a chamber of the FT-ICR to a pressure lower than the
4 stable vacuum pressure in the low temperature zone.

1 10. The method of claim 1, wherein the stable vacuum pressure is between
2 a pressure of the process stream and a high vacuum pressure of a vacuum chamber of the
3 test equipment.

1 11. A sampling system for sampling a high temperature process stream to
2 be tested in an analytical instrument, the sampling system comprising:
3 an evacuation system for maintaining a low temperature zone of the sampling
4 system at a vacuum pressure;
5 a nozzle having an orifice connecting the sample stream with the low pressure
6 zone of the sampling system; and

7 a sample introduction valve connecting the low temperature zone of the sampling
8 system with a vacuum chamber of the analytical instrument, the sample introduction
9 valve being located between the evacuation system and the nozzle.

1 12. The sampling system of claim 11, wherein the analytical instrument is
2 a mass spectrometer.

1 13. The sampling system of claim 11, wherein the analytical instrument is
2 an FT-ICR mass spectrometer.

1 14. The sampling system of claim 11, wherein the evacuation system
2 comprises a vacuum pump.

1 15. The sampling system of claim 14, wherein the evacuation system
2 further comprises a metering valve for metering an intake of the vacuum pump.

1 16. The sampling system of claim 11, wherein the orifice has a diameter of
2 between 0.005 inches and 0.025 inches.

1 17. A method for sampling from a gaseous process stream at a process
2 stream temperature and pressure, the stream having at least one component with a first
3 boiling point lower than the process stream temperature when at the process stream
4 pressure, the method comprising the steps of:

5 admitting a gas sample from the process stream through an orifice into a sampling
6 system, the sampling system having a sampling system temperature lower than the first
7 boiling point, the sampling system further having a sampling system pressure lower than

8 the process stream pressure, whereby the component in the gas sample has a second
9 boiling point at the sampling system pressure, the second boiling point being lower than
10 the sampling system temperature; and

11 introducing a portion of the gas sample into a test instrument chamber.

1 18. The method of claim 17, wherein the step of introducing the portion of
2 the gas sample into the test instrument chamber includes pulsing a piezoelectric valve.

1 19. The method of claim 17, wherein the orifice is between 0.005 inches
2 and 0.025 inches in diameter.

1 20. The method of claim 17, further comprising the step of maintaining a
2 stable vacuum pressure in the sampling system.

1 21. The method of claim 20, wherein the step of maintaining a stable
2 vacuum pressure in the sampling system includes regulating a vacuum pump throughput.

1 22. The method of claim 20, wherein the step of maintaining a stable
2 vacuum pressure in the sampling system includes regulating a valve that meters flow
3 through a vacuum pump.